AUTOMATIC POUNDER MACHINE
BASE ARDUINO FOR TRADITIONAL MEDICHINE

Proposed as one of the requirements to complete the degree of Bachelor of Engineering At the Department of Electrical Engineering Faculty Engineering

By:

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DEPARTMENT OF ELECTRICAL ENGINEERING

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AUTOMATIC POUNDER MACHINE BASE ARDUINO FOR TRADITIONAL MEDICHINE

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HALAMAN PENGESAHAN

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Has been teted in front of The Council of Examiners
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on 25 February 2017
and affirmed to complete the requirements

The Council of Examiners:

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With this acknowledgement I declare that in this final project, by all my knowledge, there is no proposed final project before in same or different university before this journal is being published.

If there is a mistake on my declaration on the future, I will be fully responsible to all my statement.

Surakarta, February 2017

Writer

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Abstract

The process of making herbal medicine in pounded manually takes time and more energy, with herbs pounder machine made by using arduino-based pneumatic can accelerate the production process and eliminate the potential risks of the spine. This machine uses an Arduino as a control, the LCD as thedisplay output, pneumatic cylinder as a suppressor to pound herbs, DC motor as mortar, and buttons as the input. After testing, this tool has some weakness that is relatively expensive tool-making cost, production costs Rp. 0 to Rp. 2,052 every month. The efficiency of this machine depends on the stability of the pressure that produced the inflator. Inflator has a time limit discharging about 20min, so that the entire producction process requires a longer time to rest because the inflator.

Keywords: arduino, pneumatic, LCD, inflator.

Abstrak

Proses pembuatan jamu ditumbuk secara manual memakan waktu dan lebih banyak energi, dengan mesin bumbu penyerap yang dibuat dengan menggunakan pneumatik berbasis arduino dapat mempercepat proses produksi dan menghilangkan potensi risiko tulang belakang. Mesin ini menggunakan Arduino sebagai kontrol, LCD sebagai output output, silinder pneumatik sebagai penekan untuk menumbuk rempah-rempah, motor DC sebagai mortir, dan kancing sebagai masukan. Setelah pengujian, alat ini memiliki beberapa kelemahan yaitu biaya pembuatan alat yang relatif mahal, biaya produksi Rp. 0 sampai Rp. 2.052 setiap bulan Efisiensi mesin ini tergantung pada stabilitas tekanan yang dihasilkan inflator. Inflator memiliki batas waktu pemakaian sekitar 20 menit, sehingga seluruh proses produksi memerlukan waktu lebih lama untuk beristirahat karena inflator.

Kata Kunci: arduino, pneumatik, LCD, inflator.

1. INTRODUCTION

Jamu is the name for the traditional medicine of Indonesia. Later, popularly known as the herb or herbs. Jamu mad from natural ingredients, be part of plants such as roots, leaves, bark, and fruit. Production method still uses traditional process by way of pounded which resulted in lengthy process of manufacture and can potentially bending of the spine, and other diseases.

Harjono (2015) has made design automation control unit condensing to increase the production of ice cubes using a microcontroller which can save energy by 78.72% since the beginning of manufacture process. Rath (2016) using arduino as the control system for the smart lights which can make energy saving process becomes easier and more efficient, while Sedhumadhavan (2014) using arduino as a safety system, bluetooth or wifi device added used as a remote control facility.

Parikh (2016) has conducted research using pneumatic and hydraulic systems as the technology that makes the job more effectively and has a higher accuracy. Mulik (2015) has been conducting research to eliminate the disadvantages of the manual method that reliance on worker skills, this advantage will have an impact on increasing productivity and increase production speed.From research that has been done, can be modeled herbs pounder machine using pneumatic-based arduino make it easier jobs well as to avoid the risks of existing.

2. METHOD

2.1 Preparation of Design

The initial plan design :

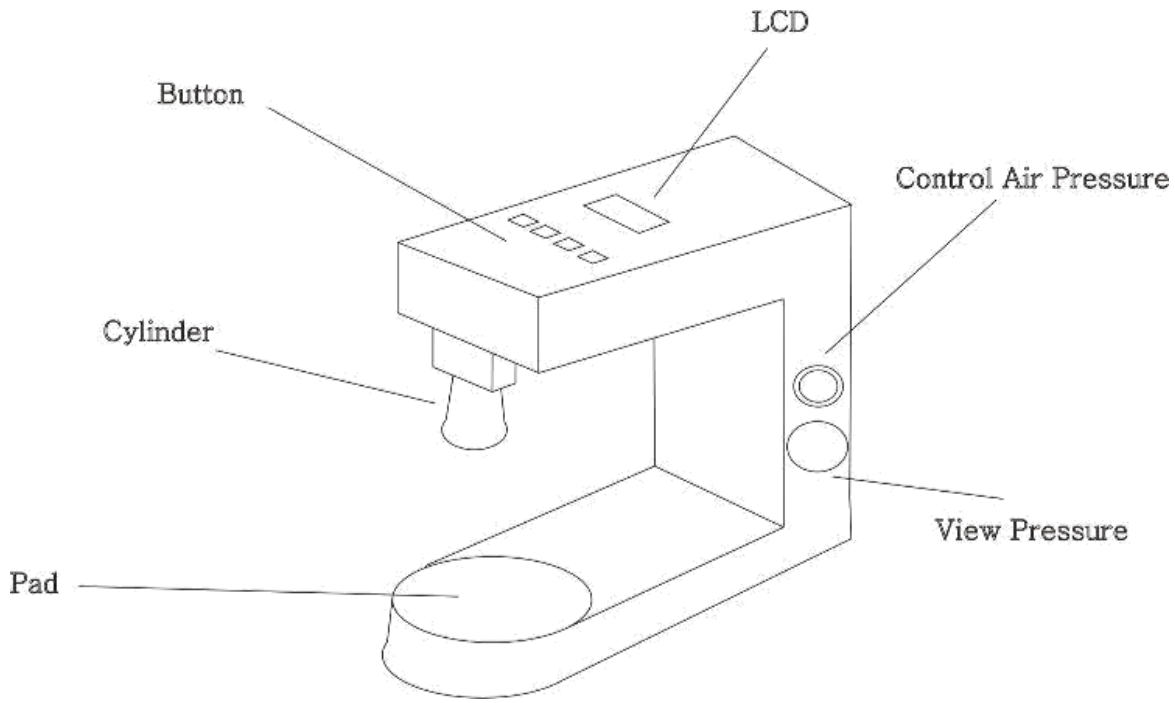

Figure 1. Preliminary Design

Planning form of automation pounder machine based arduino for traditionnal herbal as in figure 1. LCD 2x16 used as monitor of work processes. Button set the system work tool. Cylinder as a substitute for arm to move the pestle. Air regulator used to adjust the air pressure which entering from inflator.

2.2 Figure of circuit

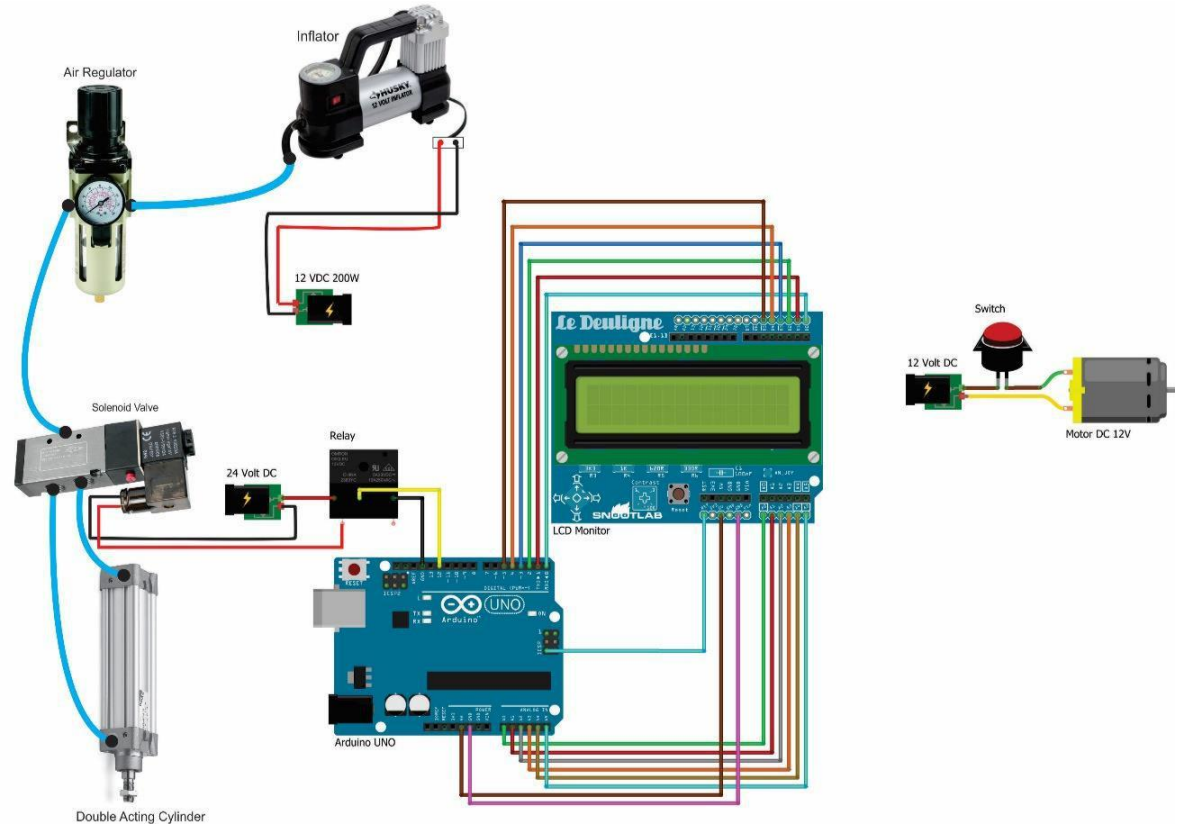

Figure 2. Figure of circuit

From figure 2 a general description of the system. Arduino becomes central movement control of pneumatic cylinder and display on the LCD. Arduino into a decision based on input from the push button and output on the actuator. Actuator in this tool there are two solenoid valve and pneumatic cylinder. Solenoid valve to regulate the air that comes out to push or pull a pneumatic cylinder. Pneumatic cylinder used is double acting cylinder that have function to provide power pressing or subtitute for arm to move the pestle. The main component in the construction, include :

1. Inflator function is to provide air pressure and is a major component that affects of work processes tools.
2. Air regulator controls the large or small air pressure that will go to double acting cylinder.
3. Solenoid valve function as an air switch that is used for double acting cylinder to be moves a push or pull.

4. Double acting cylinder have function as a subtitute for arm which compressive strength is affected by air pressure from the inflator and the movement is regulated by a solenoid valve.
5. Arduino uno have function as controls center of movement the actuator and the display on the LCD.
6. LCD is used to display a menu option in the tool.
7. Push button is used to move the menu options are already available, including the button up, down, enter and back.
8. DC motor used to drive the dimples to rotate and make the pulverization process becomes uneven.
9. Power supply provudes voltage to electronic components within the tool to work. Some voltage generated by the power supply is 12vdc for the voltage of DC motor, relay and inflator, 24vdc for solenoid valve voltage, and 7vdc arduino voltage.

2.3 Flowchart Program

Program to be made is a program timer. At the moment a toll first turns, then the loading posts will appear on the LCD. There are three menu for selection of jamu that is beras kencur, kunir asem, and kunyit asem. Up and down buttons are used to direct the menu, then press enter button if it determines to be pounded jamu, and press the back button if want to return to the original menu. Each menu has a different cycle time. Kunyit asem menu created to pneumatic cylinder for moving down during 150ms and 150ms moving up. Beras kencur menu created to pneumatic cylinder for moving down during 200ms and 200ms moving up. While the kunir asem menu will create to pneumatic cylinder for moving down during 250ms and 100ms moving up. The above program can work when the air pressure produced from the compressor is stable with an average pressure of 100psi. However, to use inflator which has a stable air pressure of 45 psi, then it time program must be changed more slowly. If too quickly resulting in air pressure into the cylinder is not enough to put pressure and can not pound until smooth. Program should be changed when using the inflator to kunyit asem menu is moving down during 500ms and 500ms moving up, while beras kencur menu become 650ms moving down and 650ms moving up, and to kunir asem menu become 700ms moving down and 500ms moving up. So the average in a second pneumatic cylinder may move once to pound using inflator. Flowchart program can be seen in figure 3.

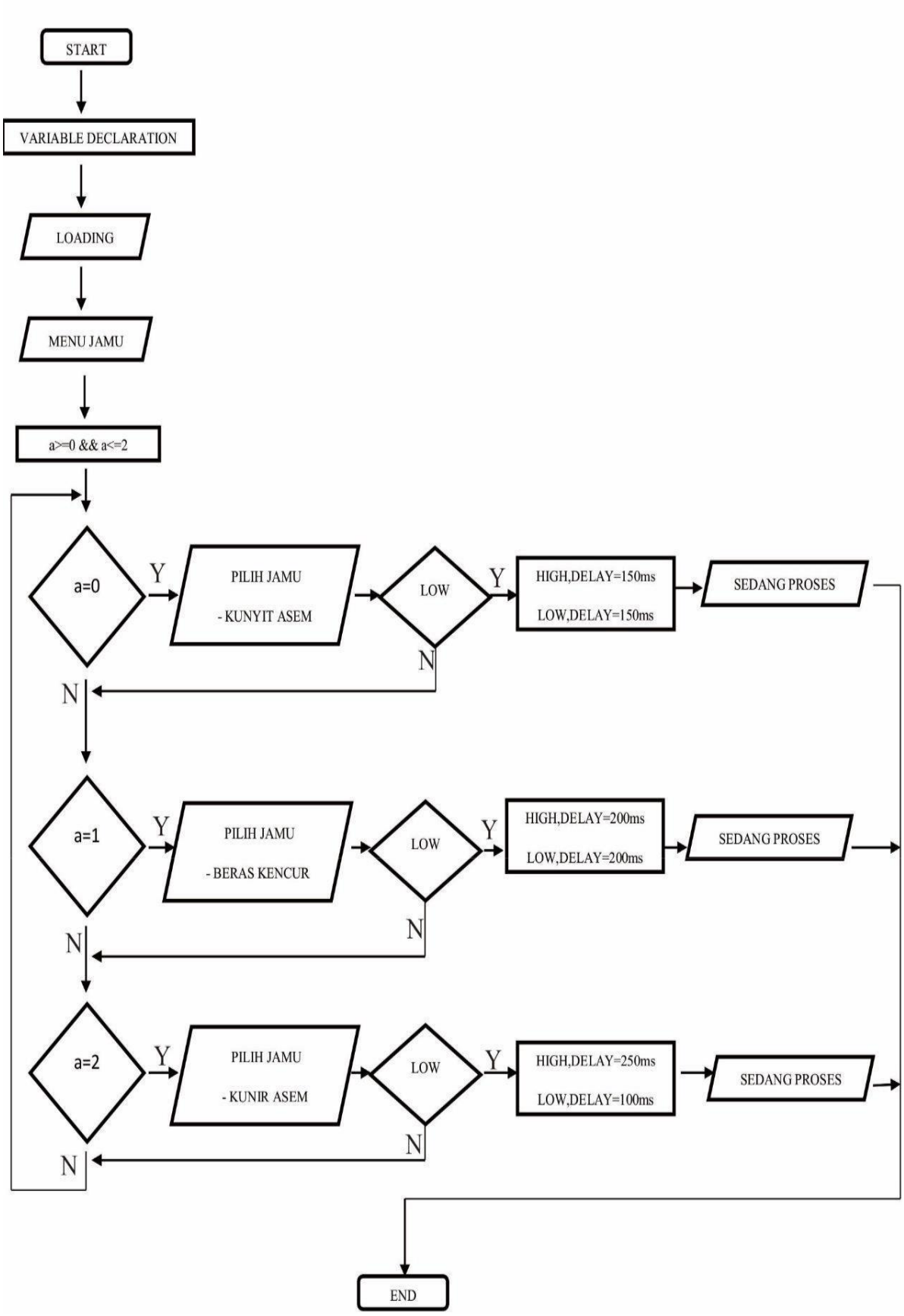

Figure 3. Flowchart Program

3. RESULT AND DISCUSSION

3.1 Results of Instrument Making

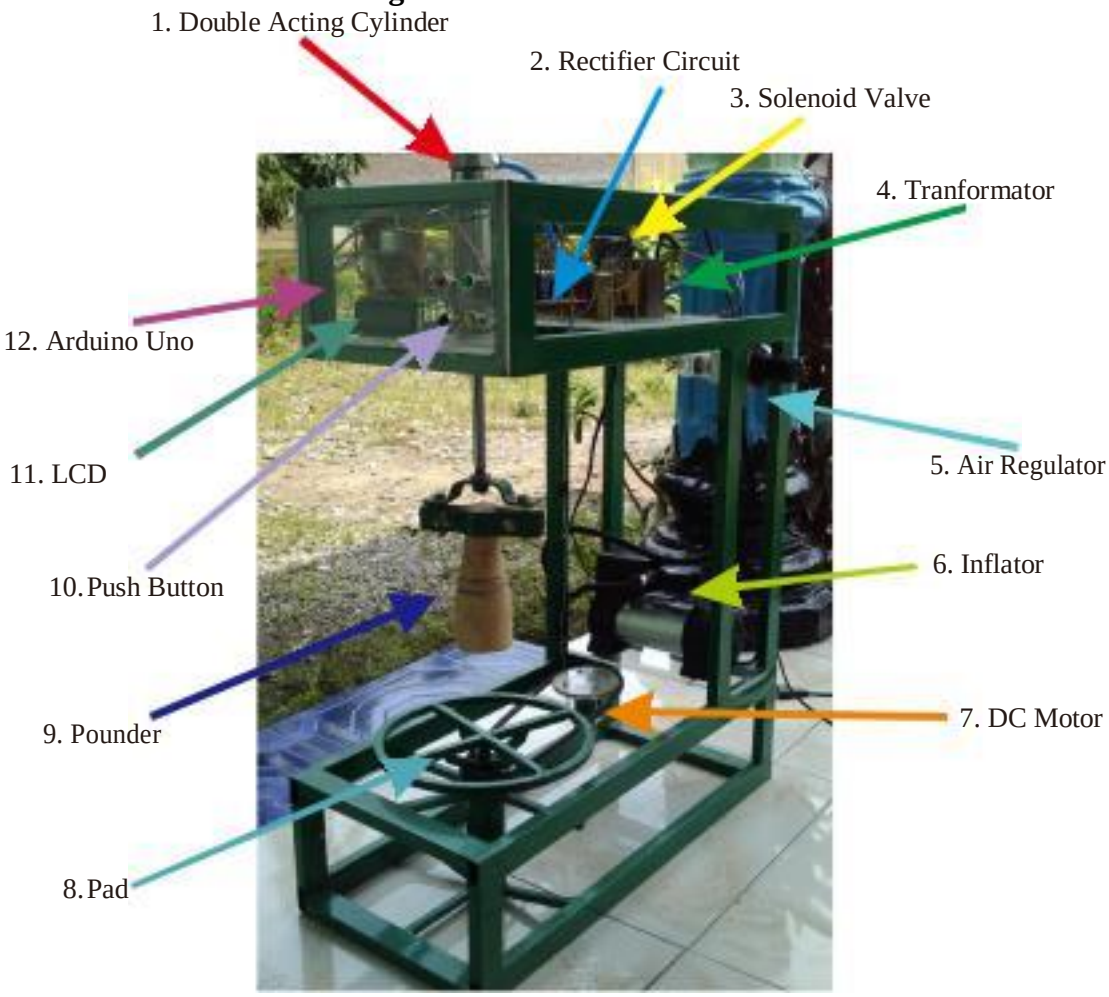

Figure 4. Results of instrument making

Figure 4 is the final result from the manufacture of traditional herbal pounder automatic. The working process of this tool is very dependent on inflator which produces air pressure. Inflator can be used for 20 minutes, so that the inflator must be rested after 20 minutes of usage. Inflator has a power of 180 watts. Using three pieces of step-down transformer to provide voltage into the circuit. 12vdc voltage required to power a DC motor, inflator, and relay. While the solenoid valve requires a voltage of 24vdc, and 7vdc to power the arduino. Double acting cylinder chosen because it is easier to set the time cycle pound. Air regulator are used to adjust the air pressure that will go into the cylinder in order to cylinders moves as needed. 2x16 LCD display 3 menu list of jamu that is beras kencur, kunir asem, and kunyit asem. There are buttons up, down, enter, and back which used to ajust the LCD display menu.

3.2 Testing Manufacture of Beras Kencur

In the manufacture of beras kencur testing performed three times a pulverization process. It is done because to get the most delicate. Result pulverization can be seen in table 1.

Table 1. Results pulverization of beras kencur

No	Runtime	Pressure	Result
1	7 minutes 13 seconds, 217 times pound	45 Psi	 *Figure 5. The first pulverization results of beras kencur, looks rough*
2	12 minutes 36 seconds, 378 times pound	45 Psi	 *Figure 6. The second pulverization result of beras kencur, looks rather smooth*
3	15 minutes 56 second, 478 times pound	45 Psi	 *Figure 7.The third pulverization results of beras kencur, looks smooth*

As shown in figure 5, result pulverization of beras kencur still looks rough when done 217 times pound. The second experiment conducted 378 times pound andas shown in the figure 6seen already a little smoother. The third experiment conducted with 478 times pound, the result looks more refined as in figure 7 andthe most good than the two previous experiments. Each experiment using air pressure of 45 psi.

3.3 Testing Manufacture of Kunir Asem

Using experiment data on beras kencur to perform pulverization in kunir asem. When the pulverization process runs approximately 13 minutes, The kunir asem looks already a little smoother. So approximately 13 minutes 45 seconds or 413 times pound the machine is turned off, because the kunir is fine. Kunir has a soft texture, making the pulverization process is faster than beras kencur. Kunir pulverization results are shown in table 2.

Table 2. Kunir pulverization results

No	Runtime	Pressure	Result
1	13 minutes 45 second, 413 times pound	45 Psi	 *Figure 8. Kunir pulverization results, looks smooth*

3.4 Cost Comparison of Jamu Production

The process of making traditional herbal medicine have different costss it is influenced by the factors of power consumption and manufacturing.

The calculation consumption cost every process of making jamu :

- The power house 900W, Electricity base tarif rate Rp. 760/kWh.
- Electrycity consumption every production during ± 30 minutes

Electricityusage = Power devices x Time usage

= 180W x 0,5hour

= 90Wh

= 0,09 kWh.

- Total production of jamu :

Electricity cost (excluding VAT & administration) = Electricity usage x Electricity base tarif rate

Power cost every production jamu	=	0,90 k Wh x 760
	=	Rp. 68,4
Costs of production 1 month	=	30 x Rp. 68.4
	=	Rp. 2,052

4. CONCLUSION

After the experiments is completed, this automatic pounder machine have advantages and disadvantages, including :

Disadvantages :

- The cost of manufacturing the tool is quite expensive, that is Rp. 1.917.500,-
- The production costs were previously 0 cost to Rp. 2,052 every month
- Efficiensy tool depends on the stability of the resulting pressure compressor.
- Inflator has a time limit discharging about 20 min, So the entire production process becomes longer because it must rest inflator.

Advantages :

- Production of jamu process becomes faster.
- Results softness jamu pulverization using tool is similar to the result manual pulverization.
- Reduce the risk of bending spine while pounding process, because the user can sit down normally when pounding.

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